REMARKS

Review and reconsideration on the merits are requested.

Claim 1, 2 and 8 are under prosecution.

The Prior Art

U.S. 5,810,925 Tadatomo et al (Tadatomo); U.S. 6,040,588 Koide et al (Koide '588); U.S. 6,420,733 Koide et al (Koide '733); U.S. 6,407,409 Cho et al (Cho).

The Rejections

Claims 1, 2 and 8 are rejected under 35 U.S.C. § 103(a) over Tadatomo.

Claims 1, 2 and 8 are rejected under 35 U.S.C. § 103(a) over Koide '588 or Koide '733 or over Cho.

The above rejections are respectfully traversed.

The Examiner's position is set forth in the Action and will not be repeated here in detail except as necessary to an understanding of Applicant's traversal which is now presented.

Traversal

Claim 1 of the present application calls for: "A self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more."

As described in the specification of the present application, page 3, the present invention is based on the finding that the X-ray diffraction half width in a {20-24} or a {11-24} **unsymmetric** diffraction plane more greatly affects the characteristics of light-emitting devices formed on a self-supported nitride semiconductor substrate than the width of an X-ray diffraction

half width in a {0002} **symmetric** diffraction plane does, and the X-ray diffraction half width as defined in the **unsymmetric** diffraction plane has a profound effect on the characteristics of the self-supported nitride semiconductor substrate.

The present invention thus provides a self-supported nitride semiconductor substrate for producing light-emitting devices, which comprises a nitride semiconductor single crystal having an X-ray diffraction half width of 500 seconds or less in a {20-24} unsymmetric diffraction plane or a {11-24} unsymmetric diffraction plane, whereby the light-emitting devices formed on the nitride semiconductor substrate using the self-supported nitride semiconductor substrate as such make it possible to obtain an excellent effect for providing high emission power at low driving voltage (see page 2, lines 16-26; and see page 3, lines 6-13 of the specification).

In contrast, Tadatomo teaches a GaN substrate having a half-width of 5-250 seconds in a {0002} symmetric plane, the GaN single crystal of Tadatomo differing substantially from the nitride semiconductor single crystal of the present invention in quality.

It should be noted that Tadatomo corresponds to Japanese Patent 3,184,717 cited as prior art at page 2, lines 6-10 of the specification.

Even if the material for the substrate, that is, the composition of the substrate is the same, the substrate may have several crystal structures. Specifically, it cannot be always said that a GaN signal crystal substrate having an X-ray diffraction half width of 5-250 seconds automatically or inherently satisfies the conditions such that the X-ray diffraction half width in a {20-24} unsymmetric diffraction plane or a {11-24} unsymmetric diffraction plane is 500 seconds or less.

To confirm whether or not a self-supported nitride semiconductor substrate comprising a nitride semiconductor single crystal having an X-ray diffraction half width of 500 seconds or less in a {20-24} **unsymmetric** diffraction plane or a {11-24} **unsymmetric** diffraction plane satisfies the X-ray diffraction half width of 5-250 seconds or less in a {0002} **symmetric** diffraction plane, the X-ray diffraction half width in a {0002} symmetric diffraction plane of the samples prepared according to Examples 1-2 and Comparative Examples 1-2 described in the specification of the present application were measured as shown in the Declaration enclosed herewith.

The results are given in Table A below.

Table A

No.	X-Ray Diffraction Half Width (second)		
	(20-24) Plane	(11-24) Plane	(0002) Plane
Example 1	278	286	275
Example 2	322	336	254
Comparative Example 1	550	568	125
Comparative Example 2	820	845	54

As is shown in Table A, even if the X-ray diffraction half width is 250 seconds or more in a {0002} symmetric diffraction plane, the X-ray diffraction half width in a {20-24} diffraction plane or a {11-24} diffraction plane has a small value of less than 500 seconds (Example 1 and Example 2). Further, if the X-ray diffraction half width is 250 seconds or less in a {0002} symmetric diffraction plane, the X-ray diffraction half width in a {20-24} diffraction plane or a

{11-24} diffraction plane has a value of more than 500 seconds (Comparative Example 1 and Comparative Example 2).

Accordingly, it can be seen from the results obtained that as a matter of fact and a matter of inherency, the materials of Tadatomo do not inherently possess the characteristics set forth in claim 1 of the present application.

Assuming, *arguendo*, that the Examiner has posed a proper *prima facie* obviousness rejection, Applicant has rebutted that rejection to show that, **as a matter of fact**, simply because a material exhibits an X-ray diffraction half width in the {0002} symmetric diffraction plane, the material does not necessarily or inherently exhibit the X-ray diffraction half width as set forth in claim 1.

Further, there is nothing of record which would suggest that the X-ray diffraction half width as set forth in claim 1 would be a characteristic of use to one of ordinary skill in the art, whereby one of ordinary skill in the art would be motivated to form a self-supported nitride semiconductor substrate having such an X-ray diffraction half width.

Thus, Tadatomo merely teaches the X-ray diffraction half width of 5-250 seconds or less in a {0002} symmetric diffraction plane. As a consequence, according to the Tadatomo disclosure, it can be said that the GaN substrates corresponding to Comparative Examples 1 and 2 above would be desirable in quality and the GaN substrates corresponding to Examples 1 and 2 would be undesirable in quality. However, the results set forth in the Declaration...1.132 summarizing Table A above establish that one of ordinary skill in the art basing such a conclusion upon the teaching of Tadatomo would, simply stated, be incorrect.

Thus, the X-ray diffraction half width in accordance with the present application is not inherently shown in Tadatomo, and the subject matter shown to be in Tadatomo does not inherently possess the characteristics relied on in claim 1 of the present application, whereby Tadatomo would render claim 1 of the present application obvious.

As a consequence, one of ordinary skill in the art referring to Tadatomo, which fails to teach or suggest the self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more as set forth in claim 1, would not be motivated to reach the invention of claim 1, and accordingly, claim 1 of the present application is not obvious over Tadatomo.

With respect to claim 2, which depends from claim 1, Applicant relies upon his arguments regarding claim 1.

Claim 8 of the present application calls for: "A light-emitting nitride semiconductor device comprising an epitaxial nitride layer with a light-emitting device structure formed on a self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more."

That is, claim 8 sets forth a light-emitting nitride semiconductor device comprising an epitaxial nitride layer with a light-emitting device structure formed on a self-supported nitride semiconductor substrate of claim 1.

Claim 8, which essentially contains all limits of claim 1, is submitted to be unobvious over Tadatomo for the reasons advanced regarding claim 1.

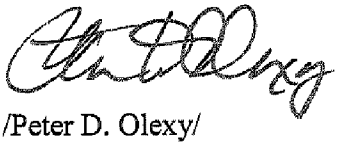
Applicant now turns to the rejection of claims 1, 2 and 8 over Koide '588 or '733 or Cho.

None of these references teach or suggest any X-ray diffraction half width of a nitride semiconductor single crystal.

Accordingly, as supported by the attached Declaration...1.132, and for essentially the same reasons as advanced with respect to Tadatomo, Applicant submits that the rejection over Koide '588 or '733 or Cho has been avoided, and withdrawal of the rejection and allowance is requested.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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Date: September 20, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Takayuki SUZUKI

Serial No.: No. 10/821,957

Filed: April 12, 2004

For: SELF-SUPPORTED NITRIDE SEMICONDUCTOR SUBSTRATE AND ITS PRODUCTION METHOD, AND LIGHT-EMITTING NITRIDE SEMICONDUCTOR DEVICE USING IT

Art Unit: 1775

Examiner: ELIZABETH D. IVEY

DECLARATION UNDER 37 CFR § 1.132

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

I, Takayuki Suzuki, a citizen of Japan, declare that:

(1) I am the inventor listed in the above-identified application.

(2) I reside at Maison Harmonie 203, 5-50-1, Kawajiri-cho, Hitachi-shi, Ibaragi-ken, Japan.

(3) I was through with Graduate School of Tohoku University, Department of Engineering, specializing in Materials Science in 2000. I was granted Degree of the Master of Engineering by Tohoku University in March 2000.

(4) I joined Hitachi Cable, Ltd. in 2000 and have been engaged in the development of compound semiconductor materials, especially Self-Supported Nitride Semiconductor Substrate since 2000.

(5) I am currently in the position of Engineer at a project team for developing GaN Substrate, Compound Semiconductor Production Division.

(6) I understand the present invention and the prosecution history of the

above-identified application.

(7) I have reviewed a Final Office Action dated June20, 2006 and the prior art document U.S. Patent 5,8910,925 (to Tadatomo et al. (Tadatomo)) of Mitsubishi Cable Industries, Ltd. cited by the Examiner.

(8) To confirm whether or not the self-supported nitride semiconductor substrate comprising a nitride semiconductor single crystal having an X-ray diffraction half width of 500 seconds or less in a {20-24} unsymmetric diffraction plane or a {11-24} unsymmetrtic diffraction plane satisfies an X-ray diffraction half width of 5-250 seconds or less in a {0002} symmetric diffraction plane, I have conducted the following experiments.

Experiments

1. Starting Materials

Starting materials were prepared in the same manners as in Examples 1-2 and Comparative Examples 1-2 described respectively in the specification of the present application.

2. Measurements

These samples were evaluated with respect to the X-ray diffraction half width in a {0002} symmetric diffraction plane by the following method.

Using a high-resolution X-ray diffractometer equipped with a quatre-crystal monochrometer using Ge (220) (manufactured by Panalytical Co., Ltd., "X' Pert PRO MRD"), X-ray was generated at 40 kV and 20 mA using a $CuK\alpha_1$ as an X-ray source to measure a diffraction peak by applying an X-ray beam to a sample to be measured from the position capable of obtaining the diffraction peak of GaN (0002).

3. Results and Discussion

The results are shown in Table A below.

Table A

No.	X-Ray Diffraction Half Width (second)		
	(20-24) Plane	(11-24) Plane	(0002) Plane
Example 1	278	286	275
Example 2	322	336	254
Comparative Example 1	550	568	125
Comparative Example 2	820	845	54

As shown in Table A above, it is evident that even if the X-ray diffraction half width has 250 seconds or more in a {0002} symmetric diffraction plane, there occurs a case where the X-ray diffraction half width in a {20-24} diffraction plane or a {11-24} diffraction plane has a small value of less than 500 seconds (Example 1 and Example 2) or even if the X-ray diffraction half width has 250 seconds or less in a {0002} symmetric diffraction plane, there occurs a case where the X-ray diffraction half width in a {20-24} diffraction plane or a {11-24} diffraction plane has a small value of more than 500 seconds (Comparative Example 1 and Comparative Example 2).

Accordingly, it can be said that the subject matter shown to be in the prior art of Tadatomo does not inherently possess the characteristics relied on claim 1 of the present application.

Specifically, Tadatomo merely teaches the X-ray diffraction half width of 5-250 seconds or less in a {0002} symmetric diffraction plane, and, consequently, according to the Tadatomo's disclosure, it can be said that the GaN substrates corresponding to Comparative Examples of 1 and 2 above are considered to be desirable in quality and the GaN substrates corresponding to Examples of 1 and 2 above are considered to be undesirable in quality. However, the results of the present experiments have revealed the facts contrary to the above.

4. Conclusion

The X-ray diffraction half width in accordance with the present

application is not inherently shown in Tadatomo, and the subject matter shown to be in the prior art of Tadatomo does not inherently possess the characteristics relied on claim 1 of the present application.

Therefore, those skilled in the art referring to Tadatomo, which fails to teach or suggest the self-supported nitride semiconductor substrate having an X-ray diffraction half width of 500 seconds or less in at least one of a {20-24} diffraction plane and a {11-24} diffraction plane, and a diameter of 10 mm or more as set forth in claim 1, would not be motivated to reach the invention of claim 1, and accordingly, claim 1 of the present application is not obvious over Tadatomo.

9) I declare further that all statements made herein on personal knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated September 18, 2006

Takayuki SUZUKI

Takayuki SUZUKI